

Abstract

Reducing PEM Fuel Cell Hard Freeze Cycles

The reactant gas manifolds (12-15) of a PEM fuel cell are modified to provide insulated manifolds (14a) having inner and outer walls (30, 31) closed off by a peripheral wall (35) to provide a chamber (36) which may be filled with a vacuum, a low thermal conductivity gas, a VIP (59) or a GFP (63). Single walled manifolds (14d, 14e) may have VIPs or GFPs inside or outside thereof. An insulation panel (40) similarly has inner and outer walls (42, 43) closed with a peripheral wall (45) so as to form a chamber (46) that may contain a vacuum, a low thermal conductivity gas, a VIP or a GFP. The tie rods 9a may be recessed 50 into the pressure plate 11a of the fuel cell stack to allow a flush surface for the insulation panel 40.